

Air Force Civil Engineer Center

*FORMER
WILLIAMS AIR FORCE BASE*

**Site LF004 Landfill
Remedial Action**

**BCT Conference Call
19 September 2019**



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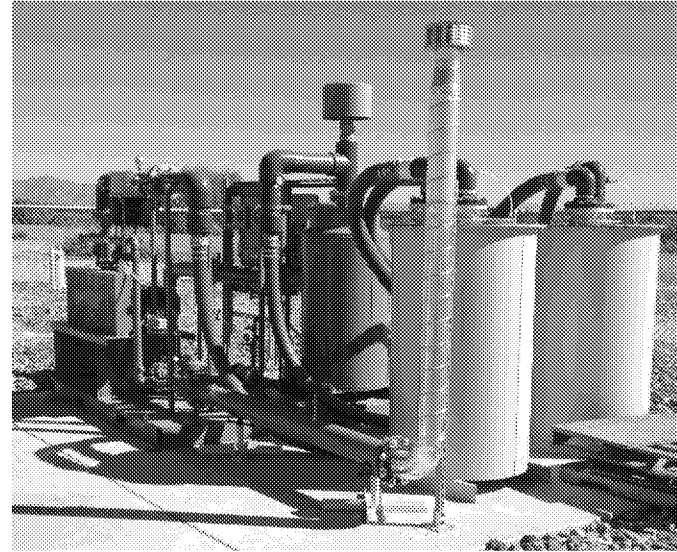
LF004 Recent and Upcoming Activities

- **Post remediation soil gas sampling is complete**
- **Final data validation of PDB groundwater sampling results for May 2019 has been completed. No revisions from preliminary results.**
- **Draft annual landfill inspection report submitted 17 Jun 2019**
- **Oxidant field screening completed in Aug 2019**
- **Planning in progress for decommissioning of SVE and IWAS treatment systems**
- **Semi-annual PDB sampling scheduled for Nov 2019**



LF01-W17 Area IWAS System Update

- Final May 2019 PDB results indicate all monitoring wells below the TCE MCL with the exception of LF01-W17S (9.0 $\mu\text{g/l}$) and LF01-W30M (12 $\mu\text{g/l}$)
- Previous 2018 PDB for LF01-W17S (May 4.2 $\mu\text{g/l}$ and Nov 6.4 $\mu\text{g/l}$) and LF01-W30M (May 4.9 $\mu\text{g/l}$ and Nov 1.5 $\mu\text{g/l}$)
- Residual oxidant measured in Aug 2019 (0.05 mg/l at W17S; 0.07 mg/l at W30M) remains to degrade residual PCE concentrations.
- Monitoring wells upgradient and downgradient of LF01-W17S and LF01-W30M are below TCE MCL



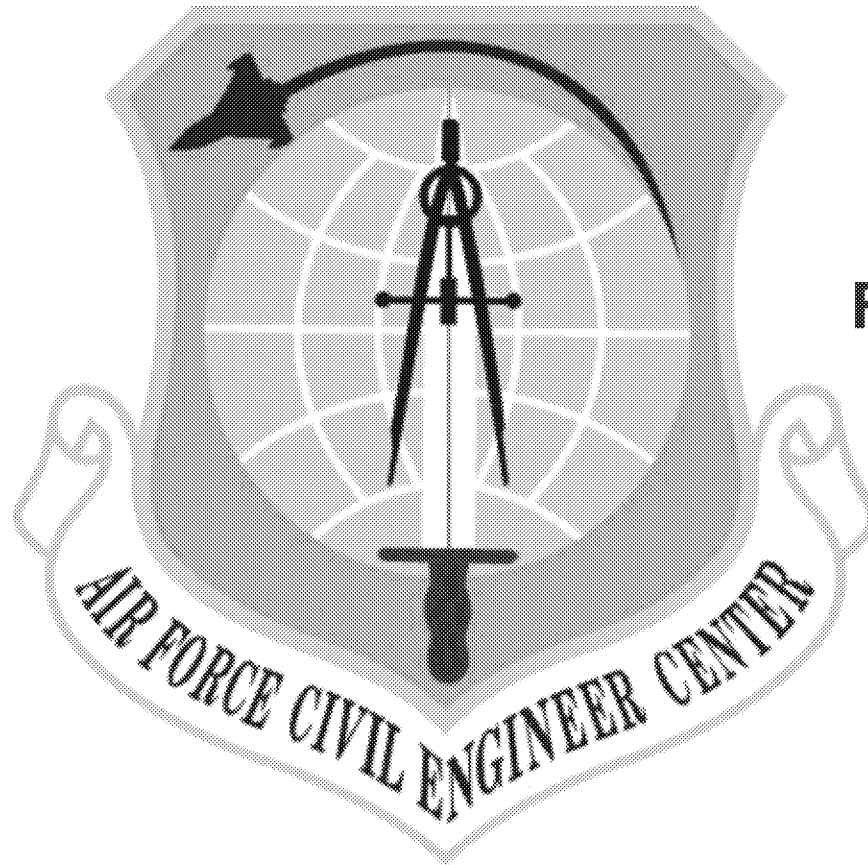


Southern Area SVE and Oxidant Injection

- **Final May PDB results indicate only two PCE MCL exceedances: W19S at 8.1 µg/l (dup 9.1 µg/l), W24S at 10 µg/l. Previous 2018 PDB results for W19S (May 2.8 µg/l and Nov 6.6 µg/l) and W24S (May 7.9 µg/l and Nov 13 µg/l).**
- **Residual oxidant measured in Aug 2019 (0.03 mg/l at W19S; 0.04 mg/l at W24S) remains to degrade residual PCE concentrations.**
- **Upgradient wells in the vicinity of W19S and downgradient wells in the vicinity of W24S are below the PCE MCL**

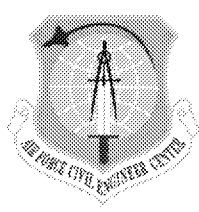
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**Site FT002
Fire Training Area Remedial
Action**

**BCT Conference Call
19 September 2019**



Site FT002 Update

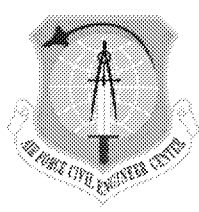
- **AF approved keeping the DEUR in place Nov 2018**
- **AF will prepare Explanation of Significant Differences (ESD) document to add the land use control to the ROD**
- **Responses to EPA and ADEQ comments on Remedial Action Completion Report under final AF review. Report is being revised in accordance with the responses to comments.**
- **If necessary, a technical conference call with regulatory agencies to resolve comments can be scheduled**

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Site SS017
Old Pesticide/Paint Shop**

**BCT Conference Call
19 September 2019**



Site SS017 Groundwater Monitoring Update Path Forward

- **Q3 (Aug) 2018 data summary report submitted 12 Apr 2019 is under regulatory review**
- **Annual (Nov) 2018 groundwater report submitted 18 Apr 2019. Reissued hard copy reports on 30 Apr 2019. Report is under regulatory review.**
- **Q3 2019 quarterly sampling completed in Aug 2019**
- **Q2 (Jun) 2019 data summary report under AF review. Preliminary data presented in Aug BCT presentation and undergoing validation.**



Parcel K-1-2 Property Transfer

- **Draft FOST and SEBS issued 30 November 2018**
- **ADEQ comments received 3 and 7 January 2019**
- **Draft final FOST and SEBS including RTC to ADEQ comments posted for public comment. Comment period end 25 Mar 2019; no comments received.**
- **EPA comments received 11 Mar 2019**
- **Draft final FOST and SEBS issued to ASU for coordination**
- **FOST (final version in track changes responding to EPA comments) was issued via email for regulatory concurrence 24 Jul 2019 with follow up email 9 Aug 2019**
- **Final FOST to be routed for AF signature after regulatory concurrence**
- **Draft DEUR and assignment package to be prepared**

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**Site ST035
Former Building 760**

**BCT Conference Call
19 September 2019**



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ST035 Update

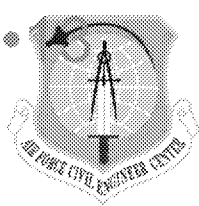
- **SVE system and enclosure decommissioning completed in July. ASU has indicated that the concrete pad, walls, and fencing will be retained for use by facilities management.**
- **Procurement of monitoring well abandonment completed. Pre-well abandonment activities in progress. Well abandonment scheduled in the late Sep-Oct 2019 time frame.**

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Partial Deletion

**BCT Conference Call
19 September 2019**



PARTIAL DELETION UPDATE

- **Draft table and figure submitted for regulatory review on 29 Sep 2014**
- **Comments received by ADEQ during Sep 2014 BCT meeting addressed in follow on email. No comments received from EPA.**
- **Deletion on hold during SS017 and ST012 informal disputes**
- **Final deletion tables and figure ready for submittal and provided to BCT in April 2019 BCT meeting**
- **Draft NOIPD submittal under AF review**
- **Draft NOIPD submittal for ADEQ/EPA review scheduled for Sep 2019**

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***FORMER
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Site ST012***

**Former Liquid Fuel
Storage Area**

**BCT Conference Call
19 September 2019**



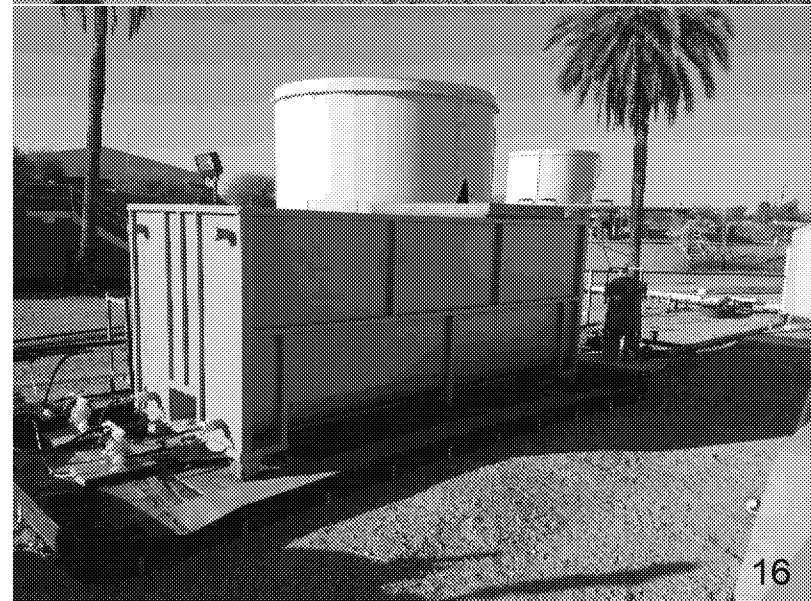
Site ST012 Outline

- **Summary of activities since Aug BCT call**
- **Update on SVE system (JP-4 equivalent of methane)**
- **LNAPL removal update**
- **Updated on benzene and sulfate concentrations**
- **Pilot study extraction/injection update**
- **Additional monitoring wells**
- **Path forward**



Site ST012 Activities Since Aug

- Continued SVE operation
- LNAPL screening in select wells
- Operation of Extraction and Treatment
 - Pump Maintenance
 - Extraction pumps in CZ07 and LSZ09 repaired
 - Shut down extraction at UWBZ26, LSZ23, and LSZ38
 - LSZ37 and CZ18 not shut down yet based on inconsistent sulfate concentrations
 - Performed backflushing of carbon to address increasing backpressure
 - Adjusting chemical dosing in groundwater treatment system to improve biological control
- Sodium sulfate injections (detail on later slides)

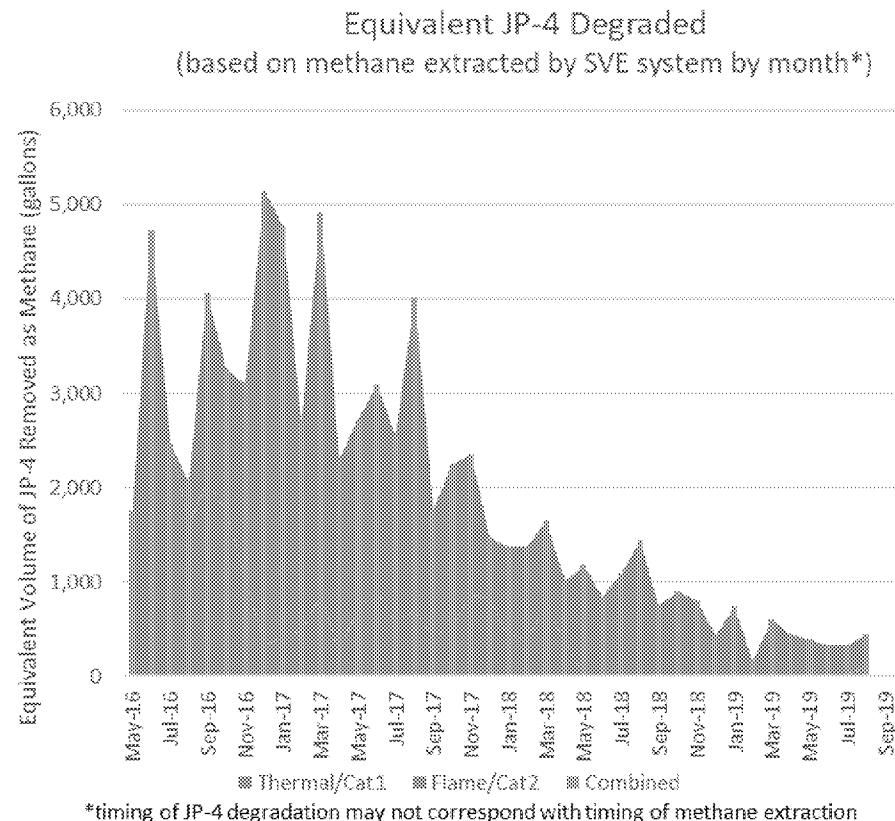
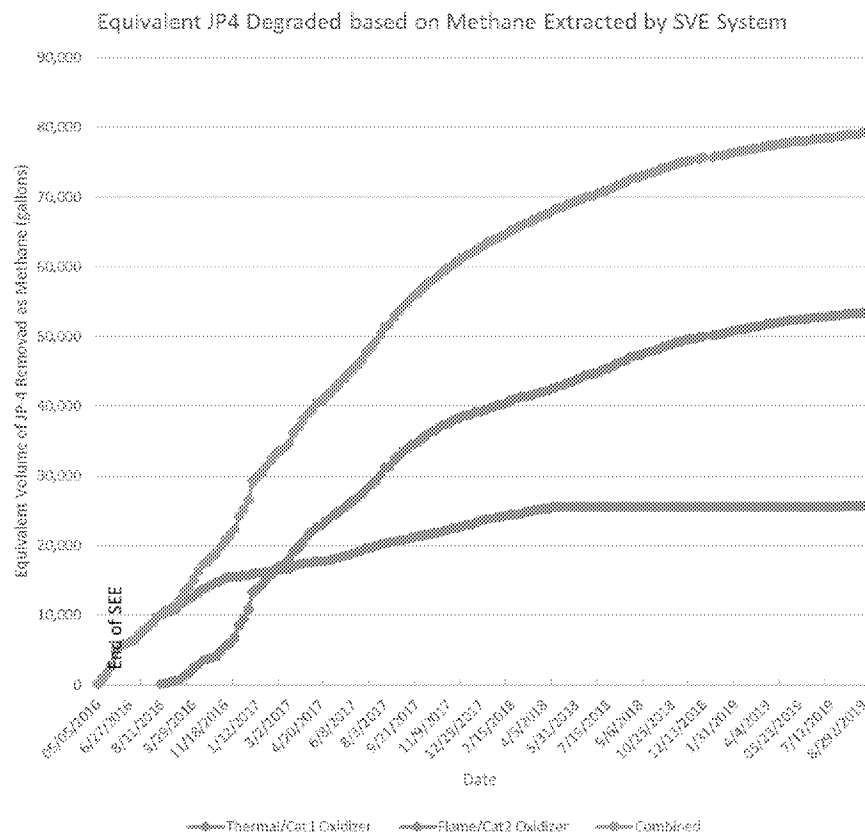




JP-4 Degradation Based on Methane Removed with SVE



Site ST012 SVE System Equivalent JP-4 Degradation Based on Methane Removed



- Estimates through 29 Aug 2019
- Estimated JP-4 degradation as methane is in addition to JP-4 removal reported for SVE
- Thermal/Cat1 oxidizer changed from SVE to groundwater treatment end of Apr 2018
- Flame oxidizer treating combined SVE and air stripper intermittently in Nov 2018 – Jan 2019
- Flame oxidizer replaced by catalytic oxidizer (Cat2) 7 Feb to 26 Feb 2019

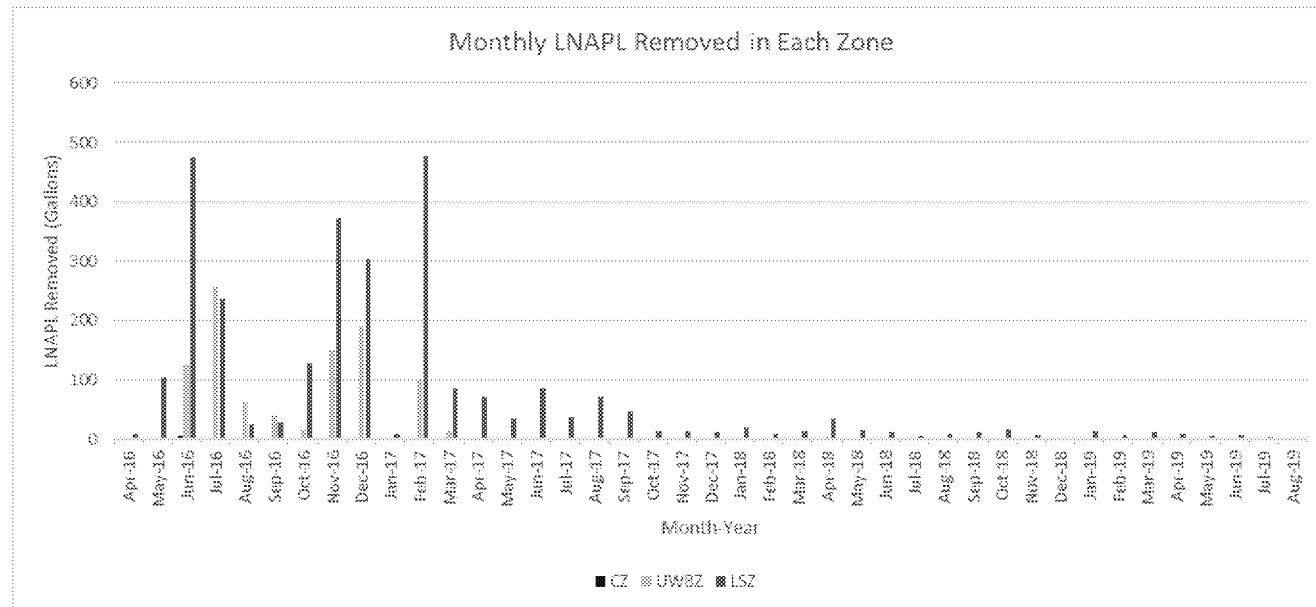


LNAPL Removal Update (through 04 Sep)



ST012 LNAPL Removal Summary

- **CZ** – 7 gallons of LNAPL removed. None since Nov 2016
- **UWBZ** - 963 gallons of LNAPL removed. None since Apr 2019 update.
- **LSZ** - 2,843 gallons of LNAPL removed. 0.5 gallons removed since Aug 2019 update (LSZ36).



Removal following initial eductor removals

Removal following remaining eductor removals

Diminished removal due to pump failure

Recovery following pump replacement

<100 gal/mo

<20 gal/mo



Updated Preliminary Second Quarter Groundwater Sampling Results



Sampling Summary

- **Sampling included:**

- Extraction Wells
- Injection Wells (where injections took place)
- Monitoring Wells (in areas where injections took place)
- Perimeter Wells
- Increase in benzene at perimeter well UWBZ38 slightly above MCL (5.4 µg/L) in June 2019 Q2. Preliminary result for resample in Aug 2019 (Q3) was below MCL (3.2 µg/L).
- Preliminary result for CZ23 resample in Aug 2019 (Q3) was 2.7 µg/L

- **Laboratory Qualifiers**

D – The reported value is from a dilution

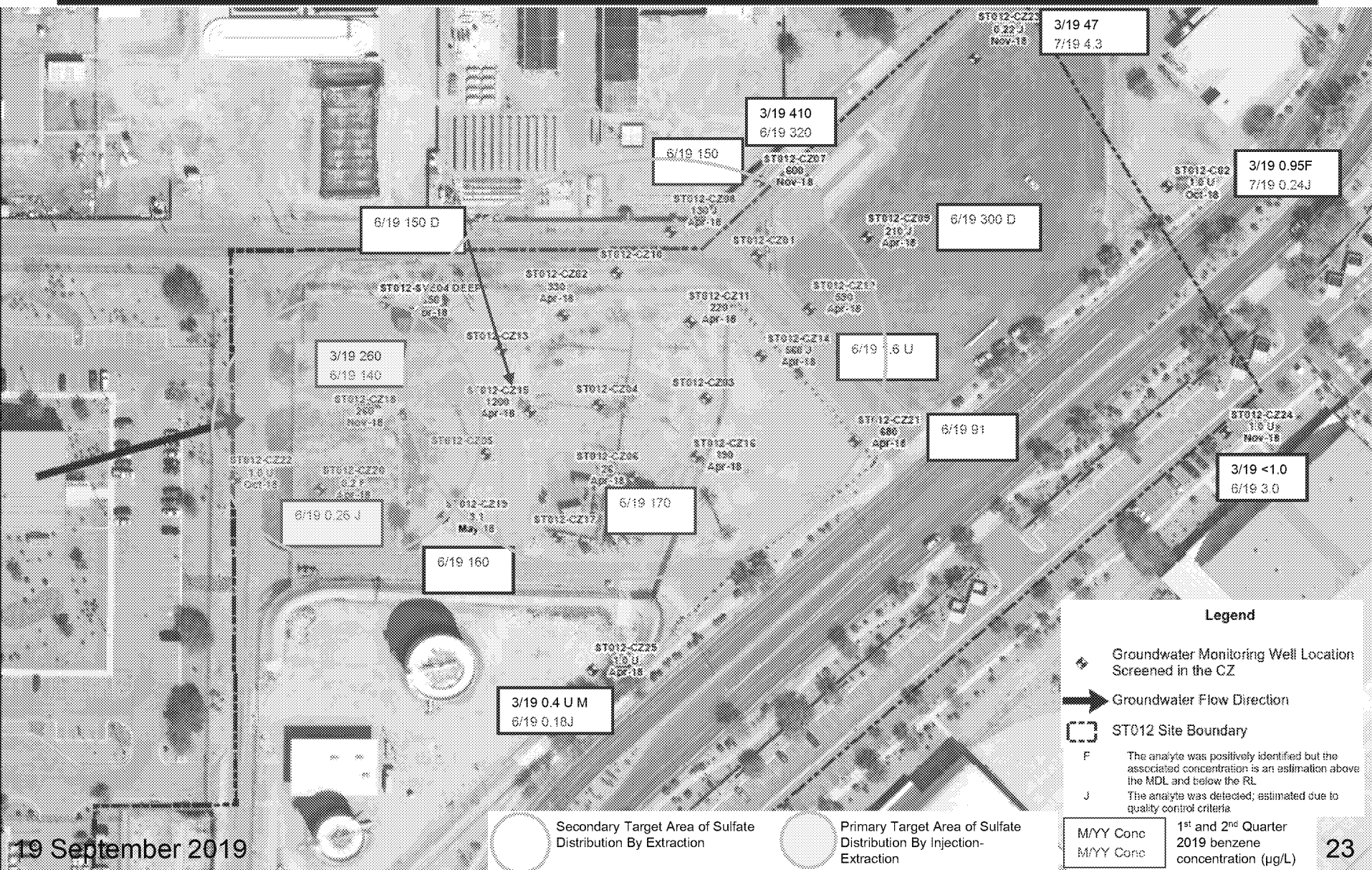
F, J – The analyte was positively identified but the quantitation is an estimation

M – Manually integrated compound

U – Not detected. Reporting limit listed

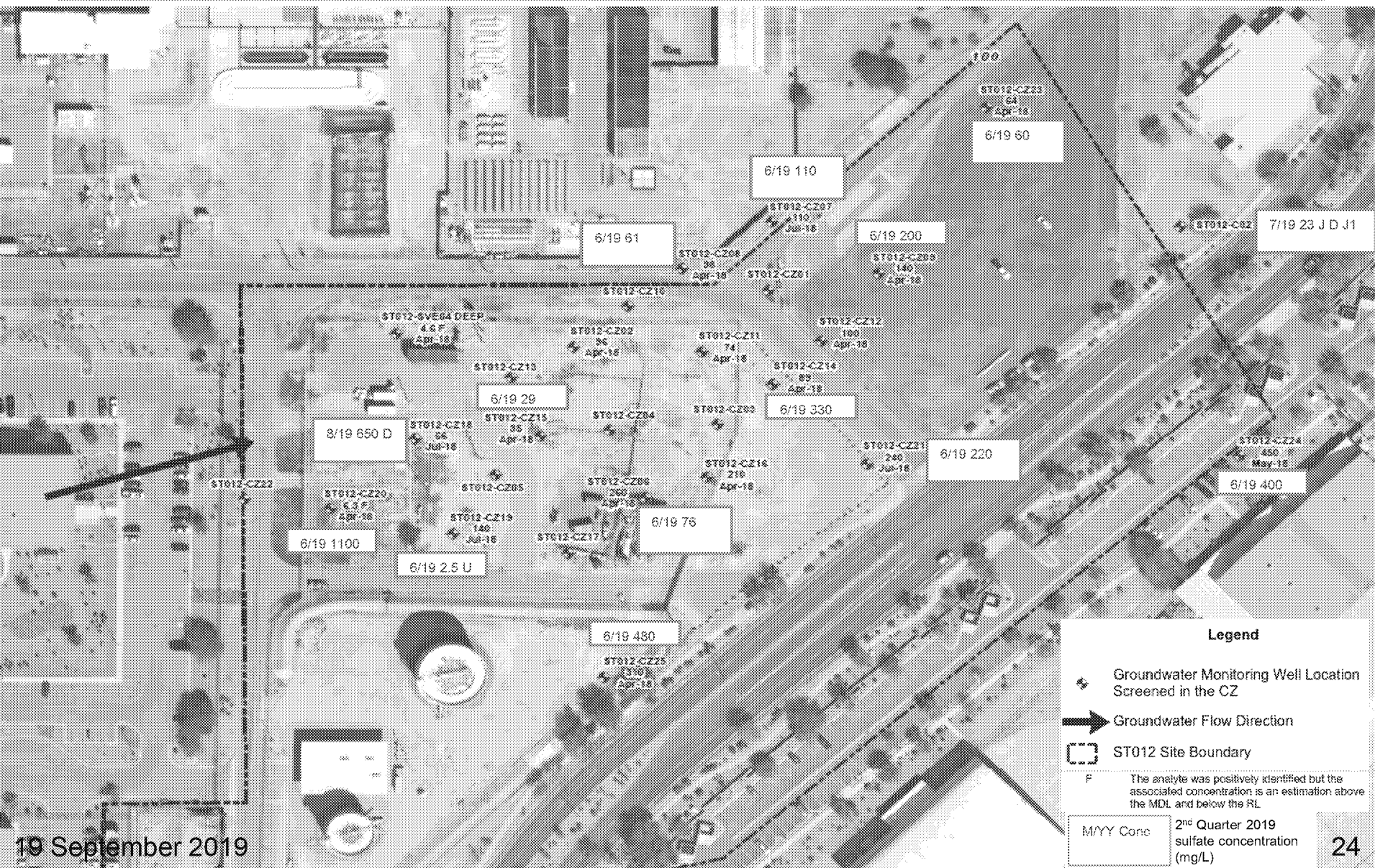


Site ST012 Benzene ($\mu\text{g/L}$) in CZ



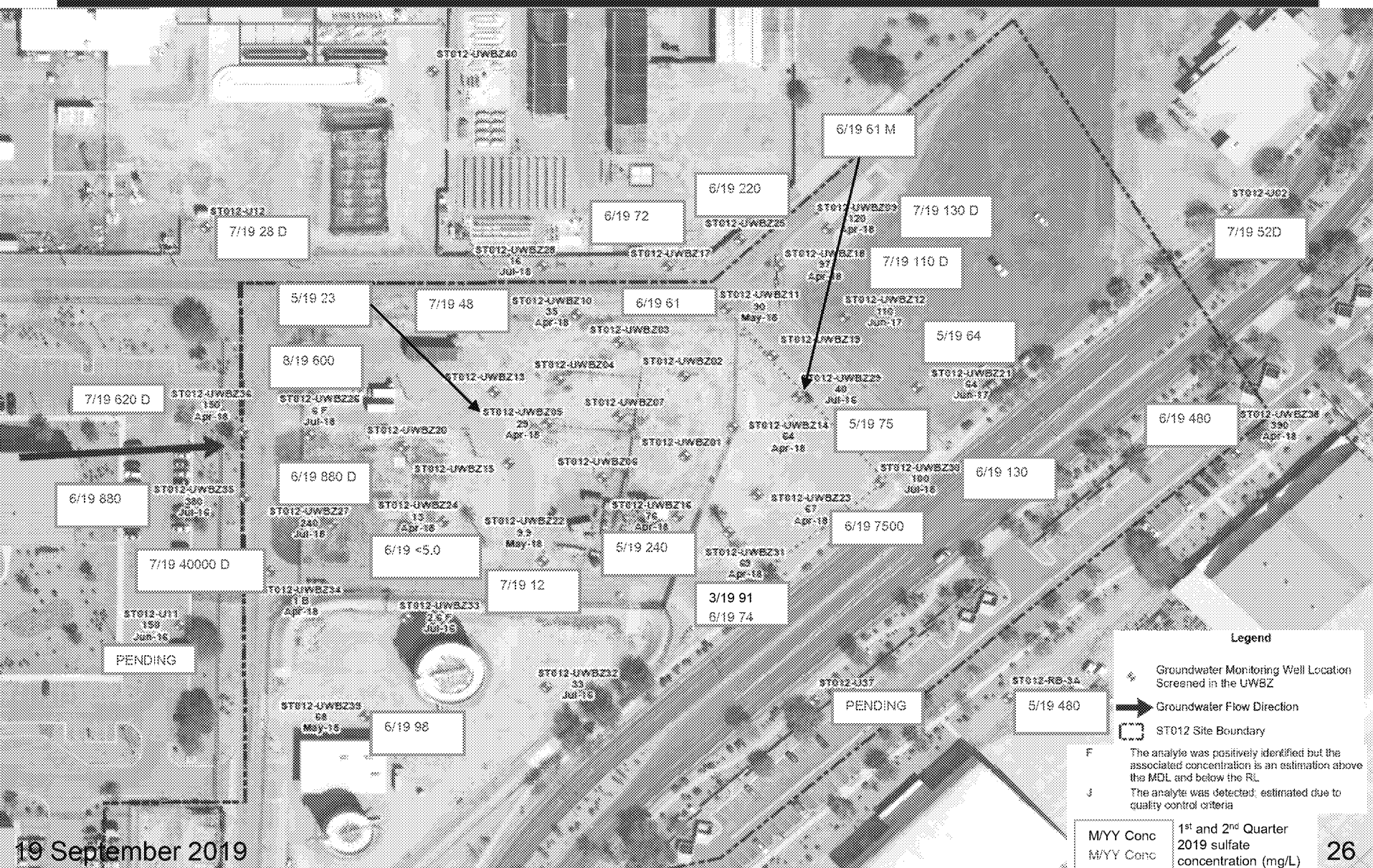


Site ST012 Sulfate (mg/L) in CZ



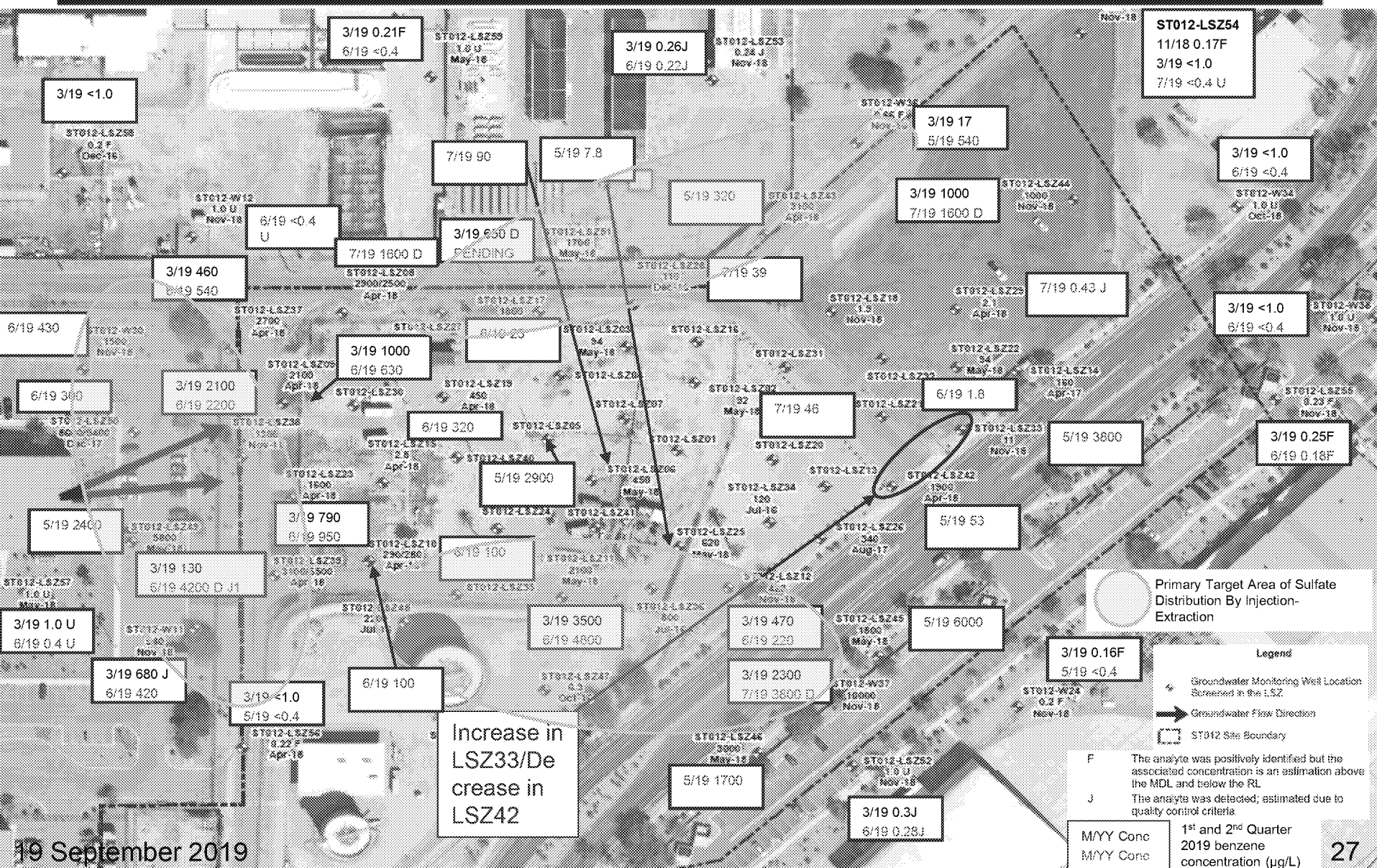


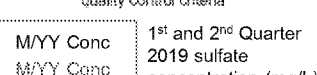
Site ST012 Sulfate (mg/L) in UWBZ

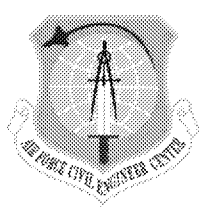




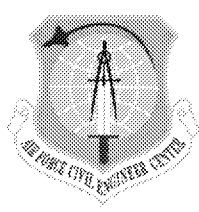
Site ST012 Benzene ($\mu\text{g/L}$) in LSZ







Pilot Study Injection/Extraction Update



Site ST012 Extraction System Performance

Extraction Well	Recent Instantaneous Measured Extraction Rate gpm	Calculated Average Extraction Rate in Period gpm	Maximum Temperature °F	Most Recent Temperature °F	Cumulative Extraction gallons	Note
ST012-CZ07	6.2	1.9	175	136	3,510,494	
ST012-CZ18	16.5	6.0	136	125	2,661,612	
ST012-CZ19						Eliminated as an extraction well by FVM#7
ST012-CZ21	18.3	1.2	150	140	403,573	Totalizer reading suspect
ST012-CZ23	4	2.9	100	100	183,089	
CZ Subtotal					6,758,769	
ST012-UWBZ21			162	105	591,514	Pneumatic pump
ST012-UWBZ22	15.7		146	124	434,950	Totalizer reading suspect
ST012-UWBZ25	10	1.4	156	156	45,292	
ST012-UWBZ26			133	114	2,408,709	Extraction stopped due to sulfate presence
ST012-UWBZ27			128	94	130,009	Extraction stopped due to sulfate presence
ST012-UWBZ30			172	84	1,397,231	Pneumatic pump, pumping intermittently
UWBZ Subtotal*					6,276,138	
ST012-LSZ09	9		140	120	2,303,442	
ST012-LSZ11	7	5.6	139	90	2,950,968	Flow meter troubleshooting
ST012-LSZ12	4.7	4.3	130	108	1,707,262	
ST012-LSZ23			113	94	3,638,934	Extraction stopped due to sulfate presence
ST012-LSZ28			162		18,899	Eliminated as an extraction well by FVM#7
ST012-LSZ29			>170		17	Eliminated as an extraction well by FVM#7
ST012-LSZ37	10.4	9.4	132	88	5,534,091	
ST012-LSZ38			160	90	941,898	Extraction stopped due to sulfate presence
ST012-LSZ39			92	78	1,250,933	Extraction stopped due to sulfate presence
ST012-LSZ43	8	7.3	138	138	366,576	
ST012-UWBZ28/LSZ51	6.9	6.9	146	128	2,536,868	
LSZ Subtotal*					19,981,454	
Total of Wells		46.9			33,016,361	
Treatment System		54.9			23,768,246	

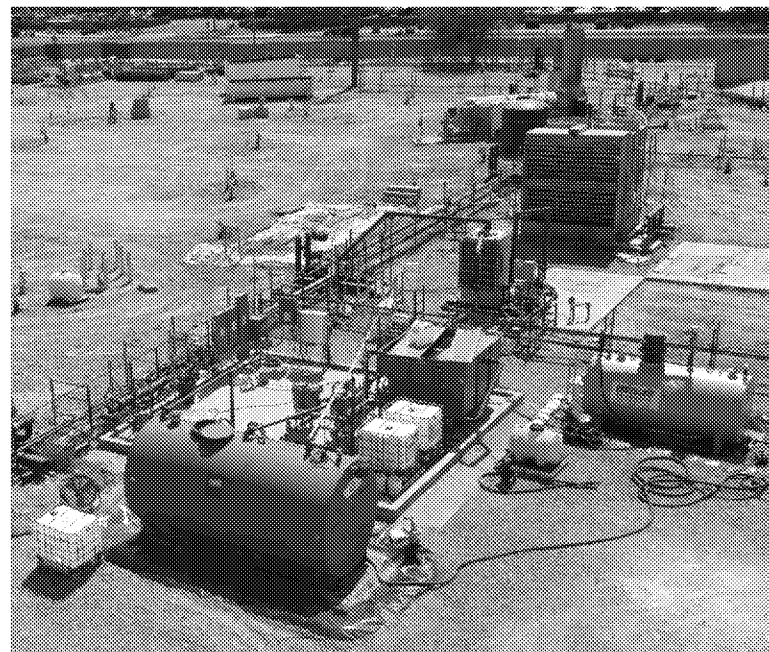
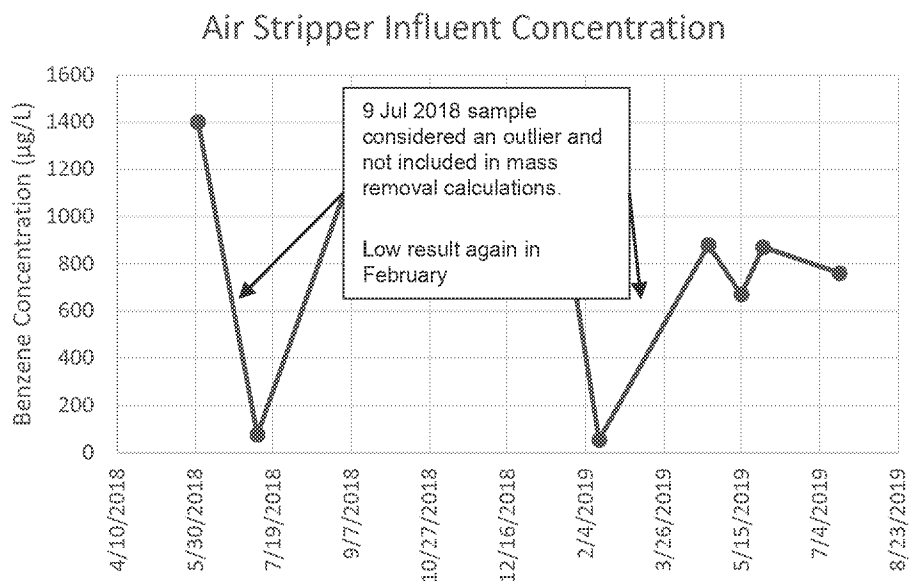
Data is preliminary

* Includes 1/2 of ST012-UWBZ28/LSZ51



Site ST012 Extraction System Performance

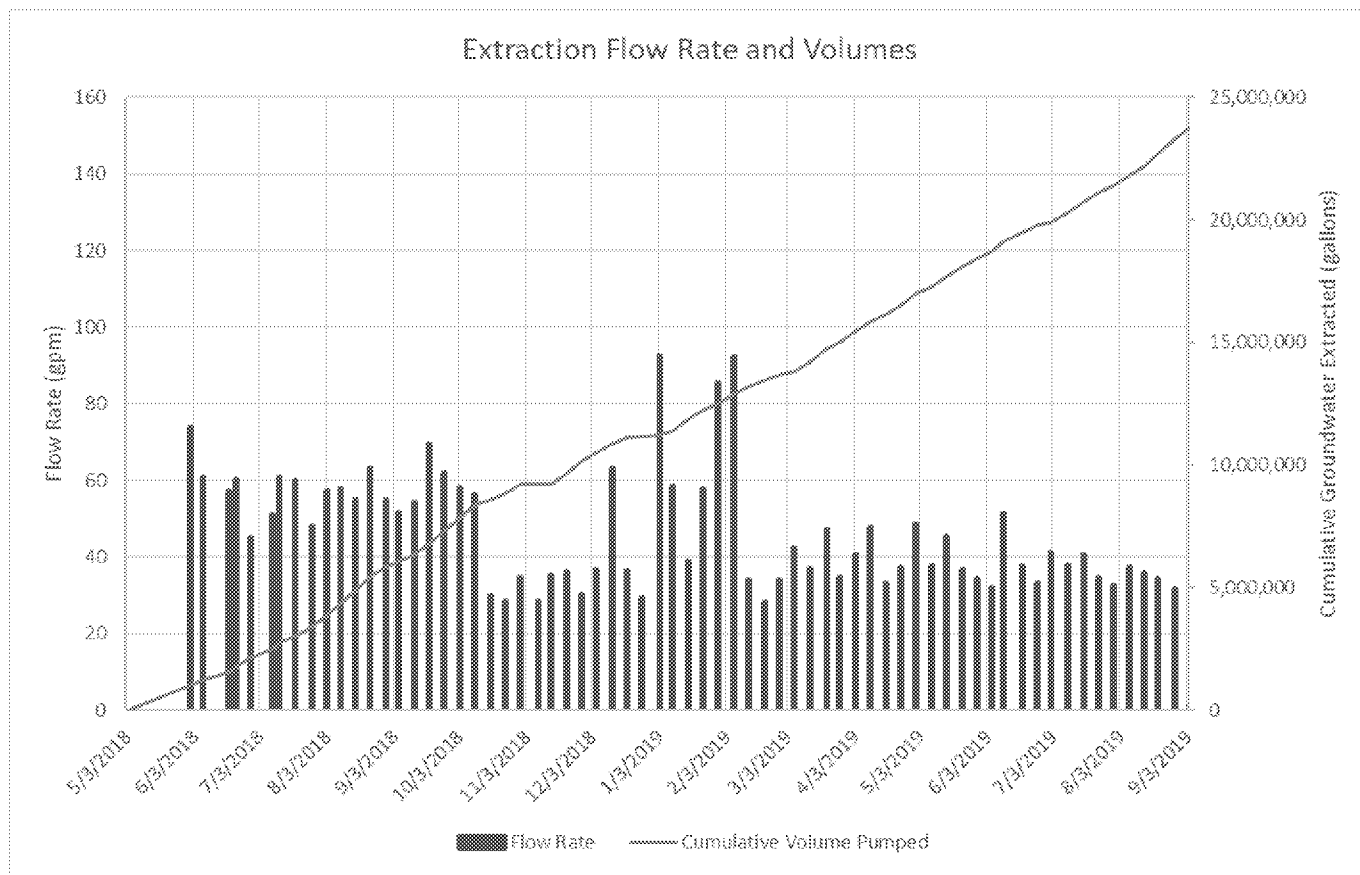
- No LNAPL has been recovered since extraction started up
- All extraction pumps working
- UWBZ26, UWBZ27, LSZ23, LSZ38, and LSZ39 turned off
- Extraction at UWBZ25 and LSZ43 recently started
- Benzene air stripper influent at 760 $\mu\text{g/L}$ for July sample
- September result for air stripper influent pending
- CZ23 preliminary result 2.7 $\mu\text{g/L}$ in August





Site ST012 Extraction System Performance

- Overall Extraction Rates and Cumulative Volume Extracted

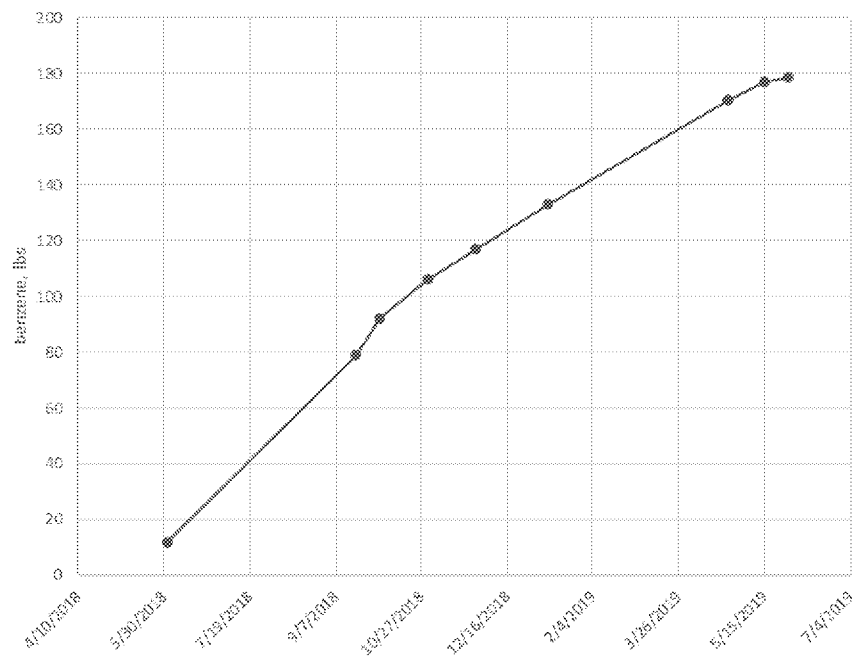




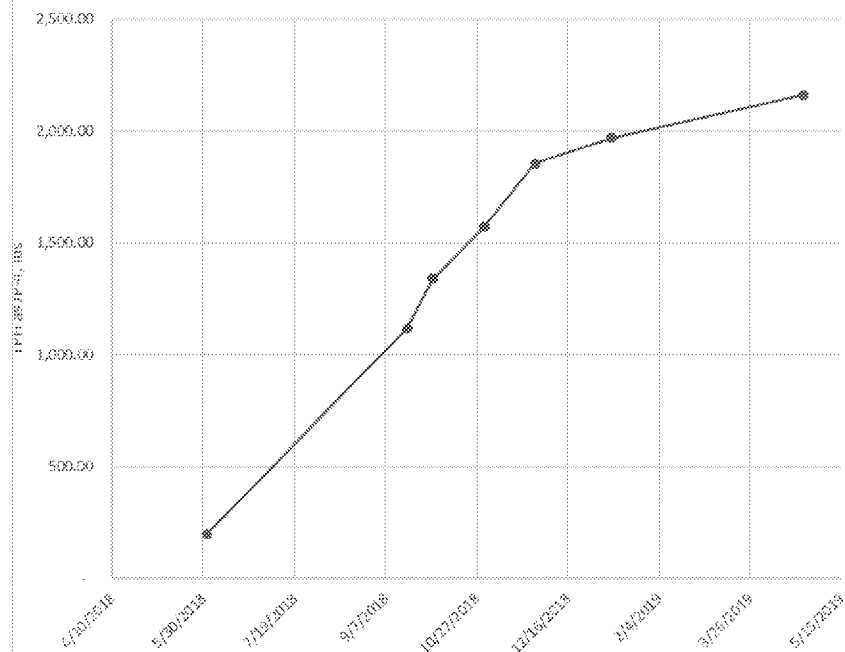
Site ST012 Extraction System Performance

- Estimated Mass Removal by Extraction
- TPH analytical results for September sample are pending

Total benzene extracted

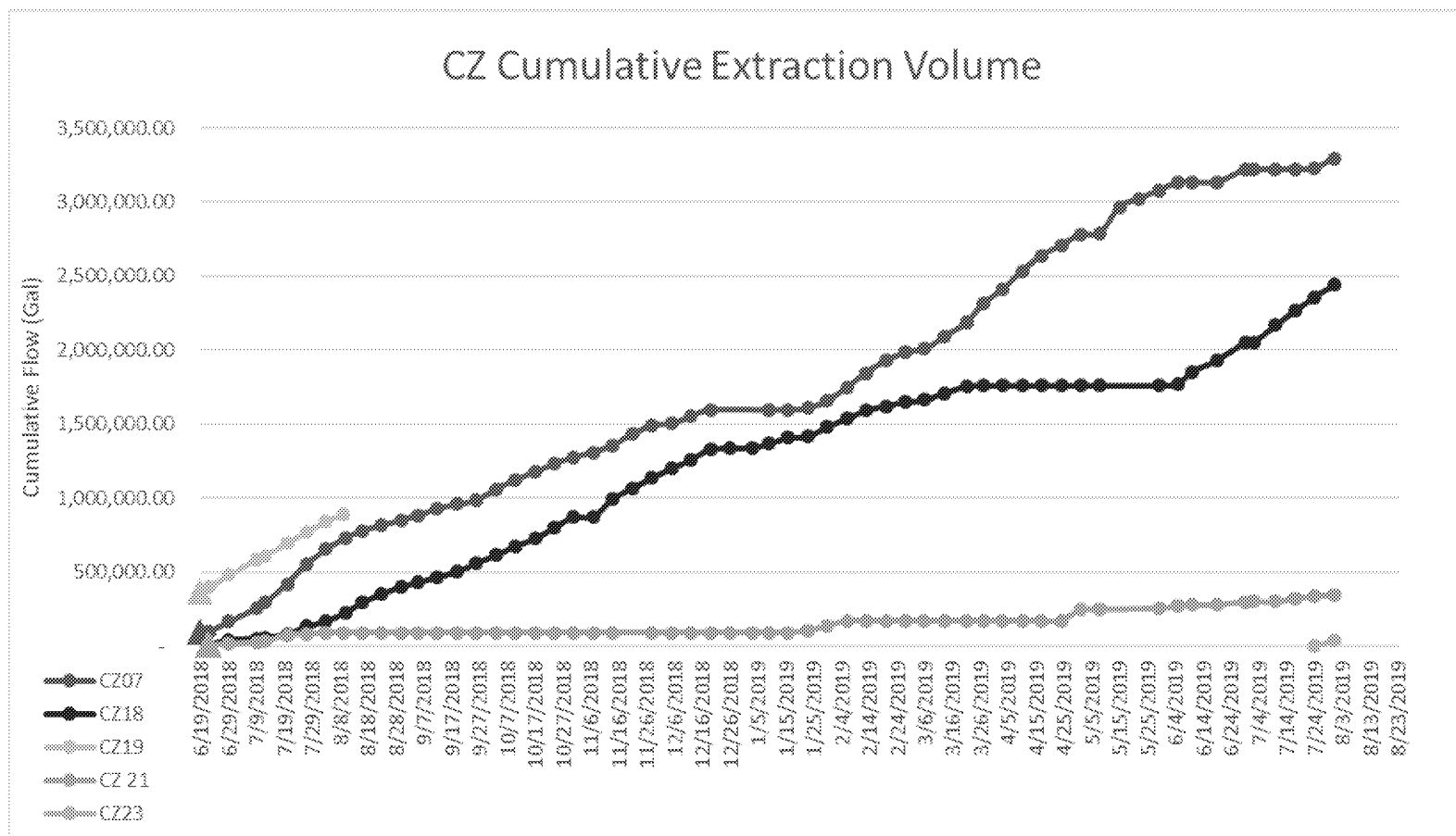


Total TPH as JP-4 extracted





Cumulative Extraction Volume by Well Cobble Zone





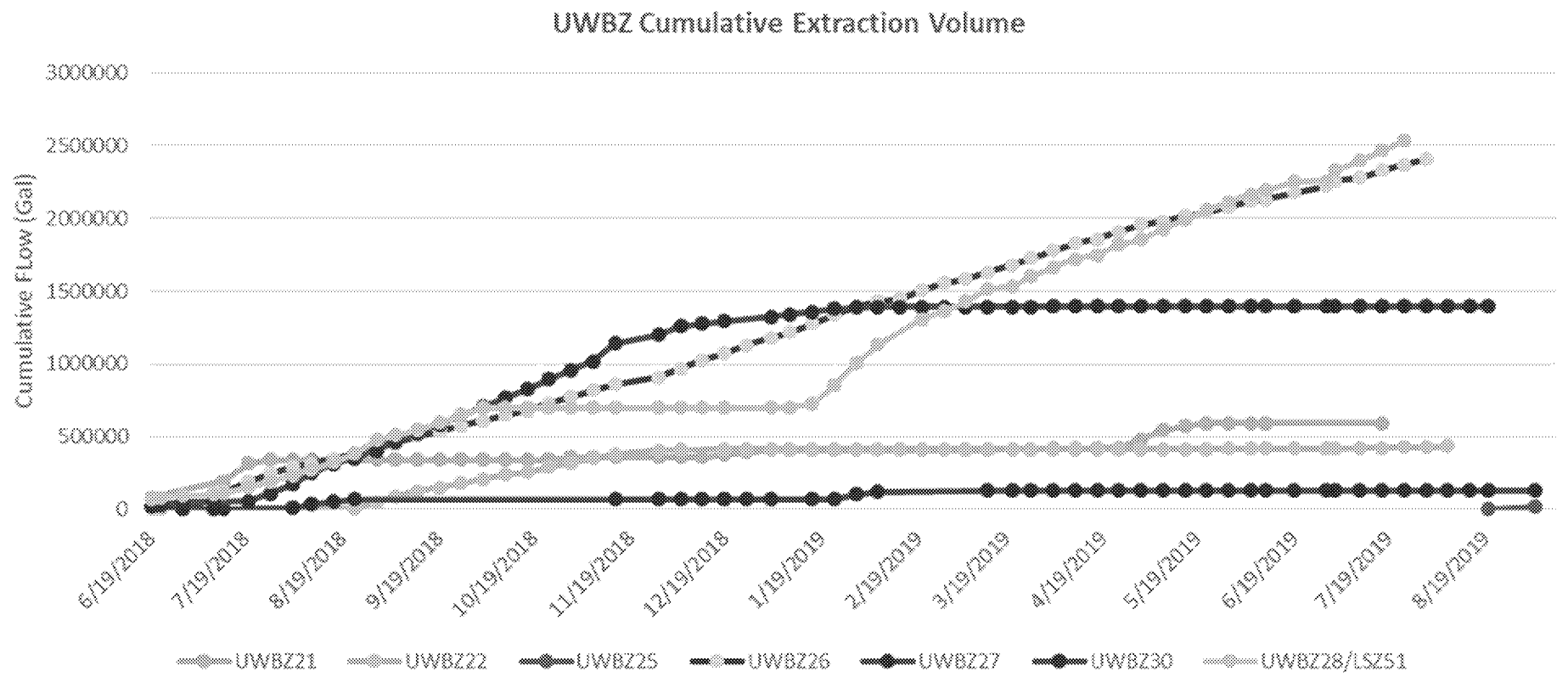
Analytical Data by Well Cobble Zone

- Most recent baseline and operating (when available) benzene analytical result listed (Jun/Jul 2019 added)

Well ID	Date Sampled	Benzene Concentration, $\mu\text{g/L}$
ST012-CZ07	4/30/2018	230
	11/1/2018	600
	2/11/2019	410
	6/18/2019	320
ST012-CZ18	4/3/2018	1200
	11/1/2018	260
	2/11/2019	260
	6/14/2019	140
ST012-CZ19	5/9/2018	3.1
	6/24/2019	160
ST012-CZ21	4/12/2018	680
	6/17/2019	91
ST012-CZ23	7/12/2019	4.3
ST012-CZ25	3/25/2019	0.4
	6/18/2019	0.18 J



Cumulative Extraction Volume Upper Water Bearing Zone





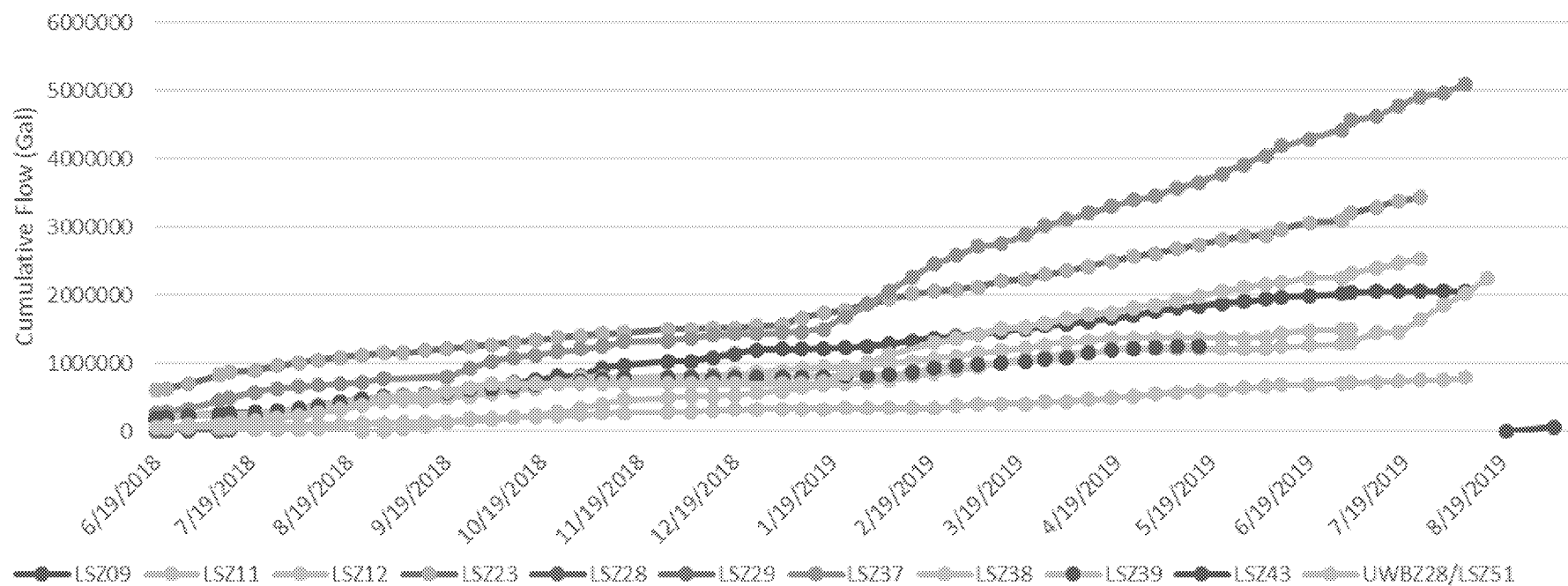
Analytical Data by Well Upper Water Bearing Zone

Well ID	Date Sampled	Benzene Concentration, µg/L
ST012-UWBZ14	5/23/2019	2000
ST012-UWBZ21	8/9/2017	3400
	5/22/2019	570
ST012-UWBZ22	5/9/2018	1900
	2/11/2019	2800
	7/11/2019	2300
ST012-UWBZ26	4/3/2018	3500
	4/3/2018	3700
	2/12/2019	2900
	6/14/2019	2100
ST012-UWBZ27	4/3/2018	1500
	2/12/2019	460
	6/14/2019	350
ST012-UWBZ28/LSZ51	5/9/2018	1700
	3/25/2019	650
ST012-UWBZ30	5/9/2018	6000
	2/13/2019	21
	6/14/2019	840
ST012-UWBZ39	3/25/19	0.4
	6/4/2019	0.4



Cumulative Extraction Volume by Well Lower Saturated Zone

LSZ Cumulative Extraction Volume





Analytical Data by Extraction Well

Lower Saturated Zone

Well ID	Date Sampled	Benzene Concentration, µg/L
ST012-LSZ09	4/3/2018	2100
	2/12/2019	1000
	6/14/2019	630 D
ST012-LSZ11	5/9/2018	2100
	2/12/2019	3500
	6/18/2019	4800 D
ST012-LSZ12	5/9/2018	1400
	11/1/2018	420
	2/12/2019	470
	6/19/2019	220
ST012-LSZ23	4/3/2018	1600
	2/12/2019	790
	6/14/2019	950
ST012-LSZ28	12/1/2016	110
	7/11/2019	39
ST012-LSZ29	4/10/2018	2.1
	7/12/2019	0.43 J
ST012-LSZ33	5/30/2019	3800
ST012-LSZ37	4/12/2018	2700
	2/12/2019	460
	6/14/2019	540
ST012-LSZ38	4/3/2018	3000
	11/1/2018	1300
	2/12/2019	2100
	6/14/2019	2200
ST012-LSZ39	4/12/2018	3100/5500
	2/12/2019	130
	6/17/2019	4500
ST012-LSZ43	5/24/2019	320
ST012-LSZ49	5/24/2019	2400
ST012-UWBZ28/LSZ51	5/9/2018	1700
	3/25/2019	650
ST012-LSZ53	3/25/2019	0.26
	6/18/2019	0.22 J
ST012-LSZ56	5/23/2019	0.4



Site ST012 Injection Progress

- Injections continued in Aug-Sept
- 279 tons injected through 04 Sept 2019 (322 tons planned through subphase 2)
- 27 tons injected since last update
- Subphase 2 injections complete
- Initiating subphase 3 injections
- Injections > mixed tons due to stored solution in frac tanks

Date	Volume (gallons)	Number of Bags of Sulfate Added	Calculated Na2SO4 Conc. g/L	Calculated SO4 Conc. g/L	Locations(% of volume if multiple locations)
7/19/2019	---	---	---	---	W30 (0.7 tons)
7/22/2019	8000	4	113	76	W30 (1.5 tons)
7/24/2019	---	---	---	---	W30 (1.1 tons)
7/30/2019	---	---	---	---	LSZ49 (1.7 tons)
8/5/2019	8000	4	113	76	LSZ49 (2.0 tons)
8/7/2019	6000	3	113	76	LSZ49 (2.1 tons)
8/23/2019	6000	3	113	76	LSZ51 (2.0 tons)
8/27/2019	---	---	---	---	LSZ51 (4.0 tons)
8/29/2019	6000	3	113	76	LSZ51 (6.0 tons)
8/30/2019	6000	3	113	76	LSZ51 (3.0 tons)
9/4/2019	---	---	---	---	LSZ51 (3.0 tons)

Note:

1. blue text indicates subphase 2 injections.



Site ST012 Sulfate Field Screening

	Sulfate Concentration (mg/L)																						
Date	CZ02	CZ07	CZ18	CZ20	CZ21	UWBZ15	UWBZ21	UWBZ22	UWBZ24	UWBZ26	UWBZ27	UWBZ28/LSZ	UWBZ30	LSZ09	LSZ10	LSZ11	LSZ12	LSZ23	LSZ35	LSZ37	LSZ38	LSZ39	LSZ47
3/1/2019	---	---	---	---	---	---	---	---	---	66	94	---	---	---	---	---	---	---	---	---	---	---	---
3/4/2019	---	---	---	---	---	---	---	---	---	67	112	---	---	---	---	---	---	---	---	---	---	---	---
3/8/2019	---	---	---	---	---	---	---	---	---	104	---	---	---	---	---	---	---	---	---	---	---	---	---
3/11/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3/15/2019	---	---	---	---	---	---	---	---	---	101	119	---	---	---	---	---	---	---	---	---	---	---	---
3/20/2019	---	---	---	---	---	---	---	---	---	97	---	---	---	---	---	---	---	---	---	---	---	---	---
3/29/2019	---	---	---	---	---	---	---	---	---	99	350	---	---	---	---	---	---	---	---	---	---	---	50
4/8/2019	---	---	---	---	---	---	---	---	---	81	297	---	---	---	---	---	---	---	---	---	---	---	153
4/16/2019	---	---	---	---	---	---	---	---	---	150	520	---	---	---	---	---	---	---	---	---	---	---	210
4/23/2019	---	---	---	---	---	---	---	---	---	---	1140	6	---	---	---	---	---	---	---	---	20	1220	---
4/26/2019	---	---	---	---	---	---	---	---	---	---	570	18	---	---	---	---	---	---	---	---	70	1230	---
5/1/2019	---	---	---	---	---	---	---	---	---	---	1110	12	---	---	---	---	---	---	---	---	77	1180	630
5/8/2019	---	---	---	---	26	---	---	---	---	---	720	---	---	---	---	---	---	---	---	---	---	---	1440
5/13/2019	1	11	---	0	---	4	7	---	1	17	---	1	10	20	90	4	21	---	59	---	12	---	---
5/15/2019	---	---	---	---	---	---	---	---	---	---	1180	---	---	---	---	---	---	---	---	---	---	---	---
5/16/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5/22/2019	---	---	---	---	---	---	---	---	---	---	1480	0	---	---	---	160	---	---	---	170	---	1420	---
5/29/2019	10	60	---	0	230	10	30	---	10	270	2000	20	110	2000	1010	90	30	610	0	200	130	1430	---
6/2/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/5/2019	---	80	---	---	280	180	---	0	---	160	1280	---	180	320	330	100	---	630	0	290	100	---	0
6/11/2019	0	---	---	0	230	---	30	---	0	280	---	0	120	320	330	---	0	740	---	410	150	1430	---
6/13/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/18/2019	---	110	---	---	250	10	---	20	---	280	1080	---	120	570	1020	250	---	670	10	400	240	---	---
6/20/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/25/2019	100	---	---	80	240	---	610	---	0	370	---	0	110	450	860	---	10	630	---	200	90	90	---
6/26/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/2/2019	---	140	---	---	180	---	---	270	---	650	1280	---	150	470	870	230	---	540	40	370	350	---	0
7/9/2019	100	---	---	510	600	---	540	---	0	640	---	10	150	450	870	---	200	750	---	420	350	1280	---
7/16/2019	---	10	---	---	250	0	---	0	---	640	290	---	100	220	820	280	---	630	10	430	430	---	0
7/18/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/23/2019	90	---	1000	430	210	---	480	---	0	630	---	10	270	200	790	---	200	590	---	390	410	1150	---
7/26/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/30/2019	---	10	---	---	230	60	---	0	---	630	500	---	240	310	740	170	---	600	40	400	400	---	0
8/6/2019	90	---	480	450	270	---	500	---	0	800	---	---	250	660	780	---	200	760	---	290	530	1280	---
8/9/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/13/2019	---	0	---	---	200	40	---	0	---	580	1000	---	110	300	700	200	---	780	---	300	560	---	0
8/14/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/20/2019	70	---	680	450	240	---	470	---	0	540	---	---	100	650	800	---	190	740	---	250	610	---	---
8/22/2019	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/27/2019	---	---	---	---	230	10	---	10	0	1470	900	---	130	560	720	340	---	690	---	290	750	---	0
9/3/2019	0	---	280	0	210	---	60	---	0	710	---	---	110	560	670	---	210	870	---	200	1000	---	---
9/10/2019	---	80	---	---	200	13	---	60	---	610	580	---	110	590	630	300	---	650	---	210	580	---	0

UWBZ26 & UWBZ27
extraction shut down

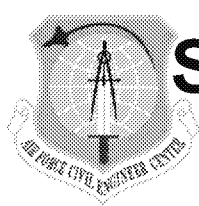
LSZ23, LSZ38 and LSZ39
extraction shut down

CZ07	Screening location is an extraction location
CZ20	Screening location is a monitoring well



Site ST012 Sulfate Field Screening

- **CZ18** – recently decreasing however, lab result (790) did not decrease, continue to track and potentially shut down
- **CZ20** – most recent result decreased
- **LSZ09** – continues to show indications of sulfate from injections, evaluate shutting down
- **LSZ11 and LSZ12** – increasing sulfate but still within range of the aquifer background
- **LSZ37** – had indications of sulfate from injections but recently decreasing



Site ST012 Sampling and SRB Field Screening in Recently Stopped Extraction Wells

- **Extraction wells that were recently stopped were sampled ~2 weeks after shutdown for laboratory VOCs, metals, nitrate, sulfate and field screening for sulfate reducing bacteria (BART)**
- **Recent preliminary BART screening results for sulfate reducing bacteria**
 - **UWBZ26: reaction after 4 days \approx 27,000 cfu/ml**
 - **LSZ23: no reaction $<$ 1 cfu/ml**
 - **LSZ38: reaction after 2 days \approx 500,000 cfu/ml**



Site ST012 Path Forward Sept-Oct

- **Continued SVE operation**
- **Continue pump repairs**
- **Pilot Study Implementation**
 - Continue mixing sulfate batches and inject according to plan (FVM7) Phase 1 subphase 3 injections with the modifications previously presented
 - Shut down extraction at LSZ09
 - Continue to track sulfate at CZ18 and LSZ37 and shut down if sulfate concentrations are sustained above 500 mg/L
 - Evaluate data (including lab BTEX, lab inorganic, field screening inorganic, and field screening SRB) at potential locations for laboratory biological testing and present in October BCT meeting

Air Force Civil Engineer Center



***2019 BCT
MEETINGS/CONFERENCE
CALLS SCHEDULE
DELIVERABLE TRACKING***

**BCT Conference Call
19 September 2019**

Air Force Civil Engineer Center



BCT GENERAL UPDATE AND ACTION ITEMS

**BCT Conference Call
19 September 2019**